

An Overview of Mercury in the Four Corners and Surrounding Areas

September 9, 2013
Four Corners Air Quality Group

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Agenda

- Colorado Department of Public Health and Environment
 - Introduction
 - Facilities and Emissions
 - Fish Monitoring and Consumption Advisories in Four Corners
- National Park Service
 - Deposition Monitoring
 - Risk Assessment
 - Fish and Dragonfly Studies
- Environmental Protection Agency
 - Passive Mercury Regionally Applied Research Efforts

Why is Mercury Important?

- Naturally occurring, but potent neurotoxin
- 50-70% of mercury due to human activities
- Persistent
- Exposure interferes with basic functions
- Significant exposure can cause brain or vital organ damage

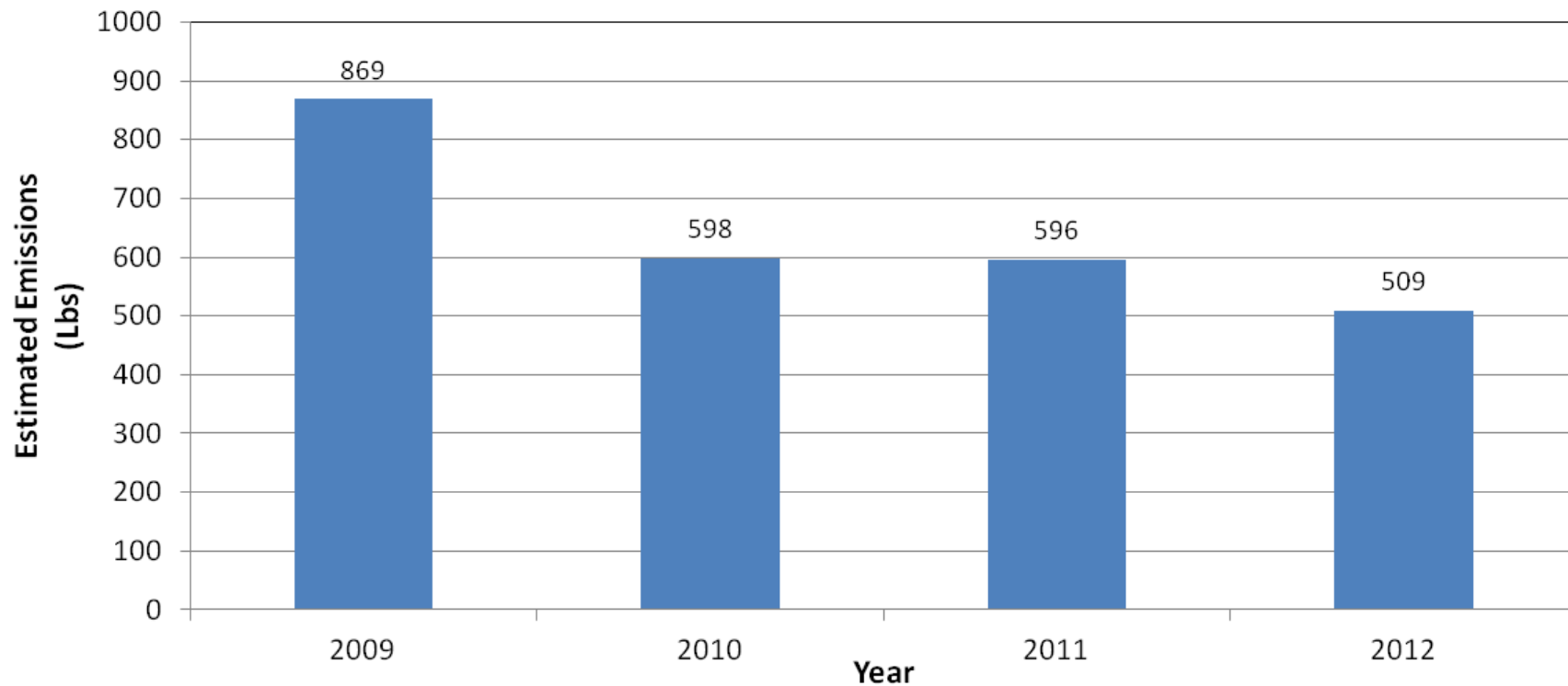


Colorado Facilities

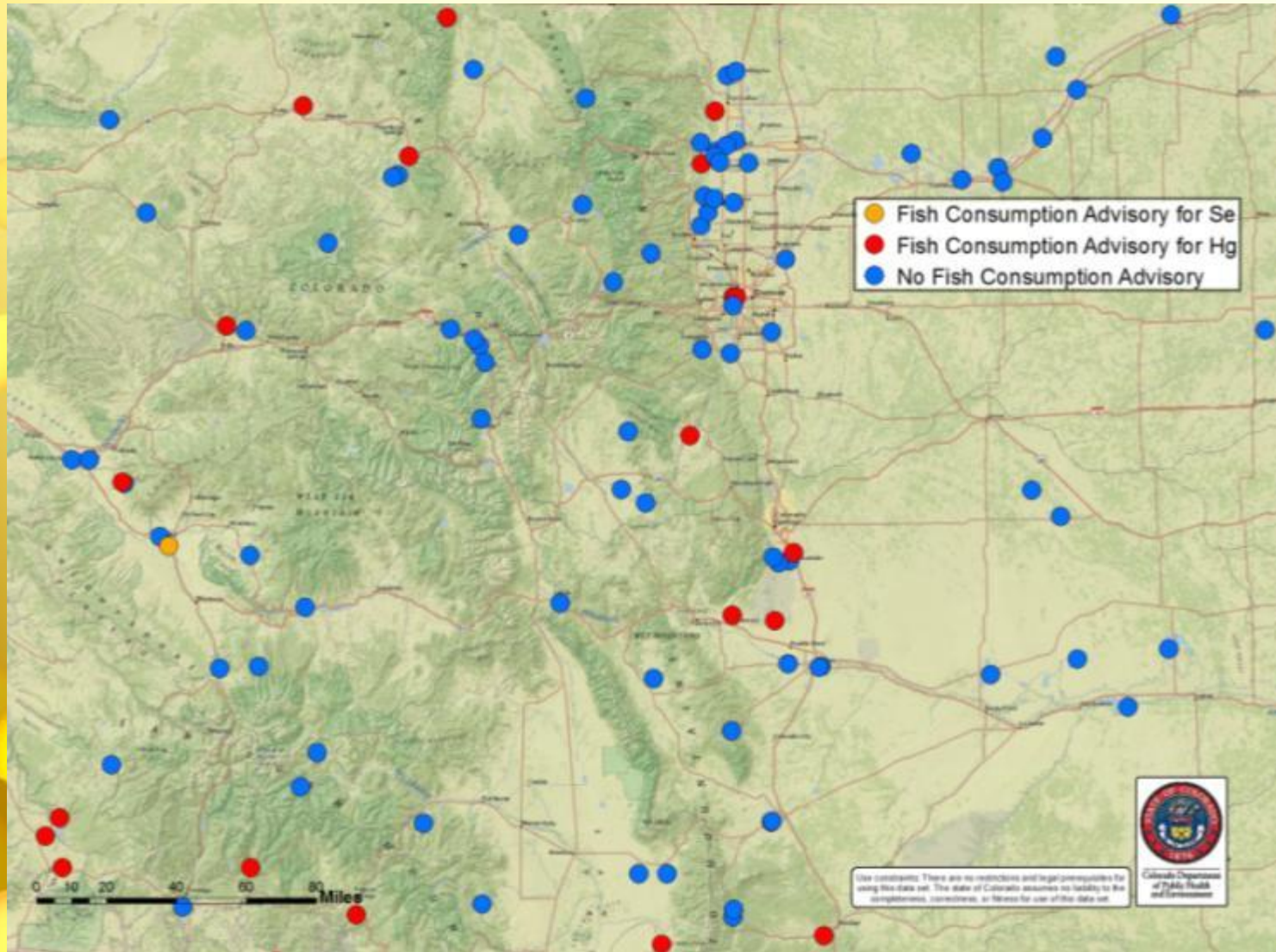


Company	Facility	Unit	MW
CO Springs Utilities	Drake	5	51
		6	85
		7	142
CO Springs Utilities	Nixon	1	227
Platte River Power Authority	Rawhide	1	295
Public Service	Arapahoe	1	closed
		2	closed
		3	48
		4	118
Public Service	Cherokee	1	closed
		2	closed
		3	168
		4	388
Public Service	Comanche	1	350
		2	350
		3	750
Public Service	Hayden	1	205
		2	300
Public Service	Pawnee	1	547
Public Service	Valmont	1	199
Tri-State Generation	Craig	1	428
		2	428
		3	408
Tri-State Generation	Nucla	1	110

Estimated Mercury Emissions from Facilities in Colorado Over the last 4 years



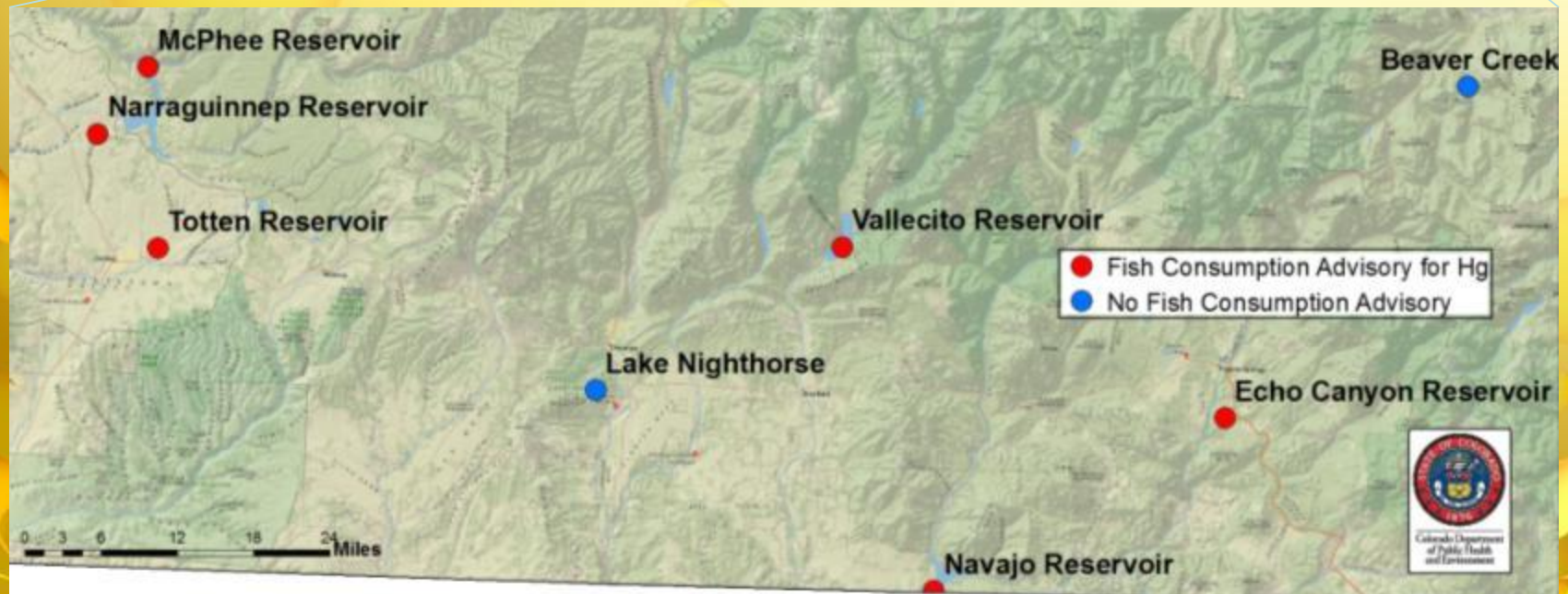
Colorado Fish Tissue Monitoring Sites



<http://www.colorado.gov/cdphe/fish>

CDPHE

Current Mercury Fish Consumption Advisories in Southwestern Colorado

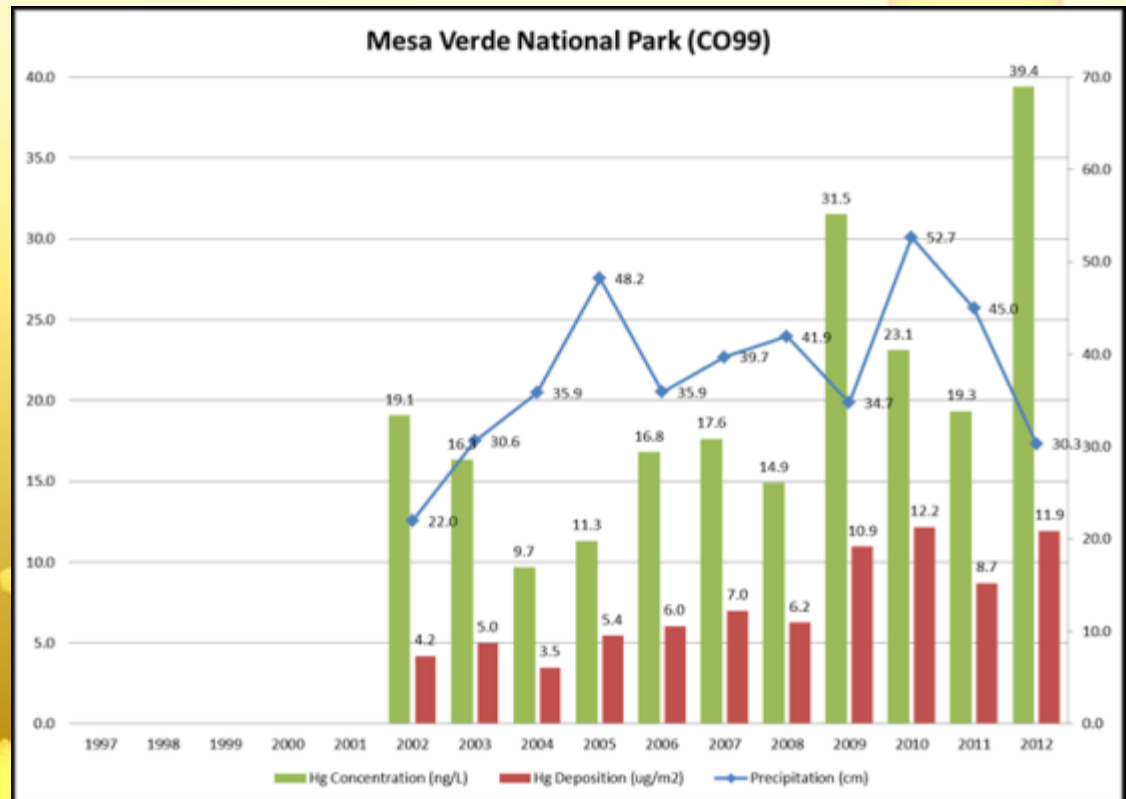


Mercury Monitoring Data

In an assessment of 10* Mercury Deposition Network sites across Western North America, Mesa Verde NP was the only site showing increasing levels of mercury.

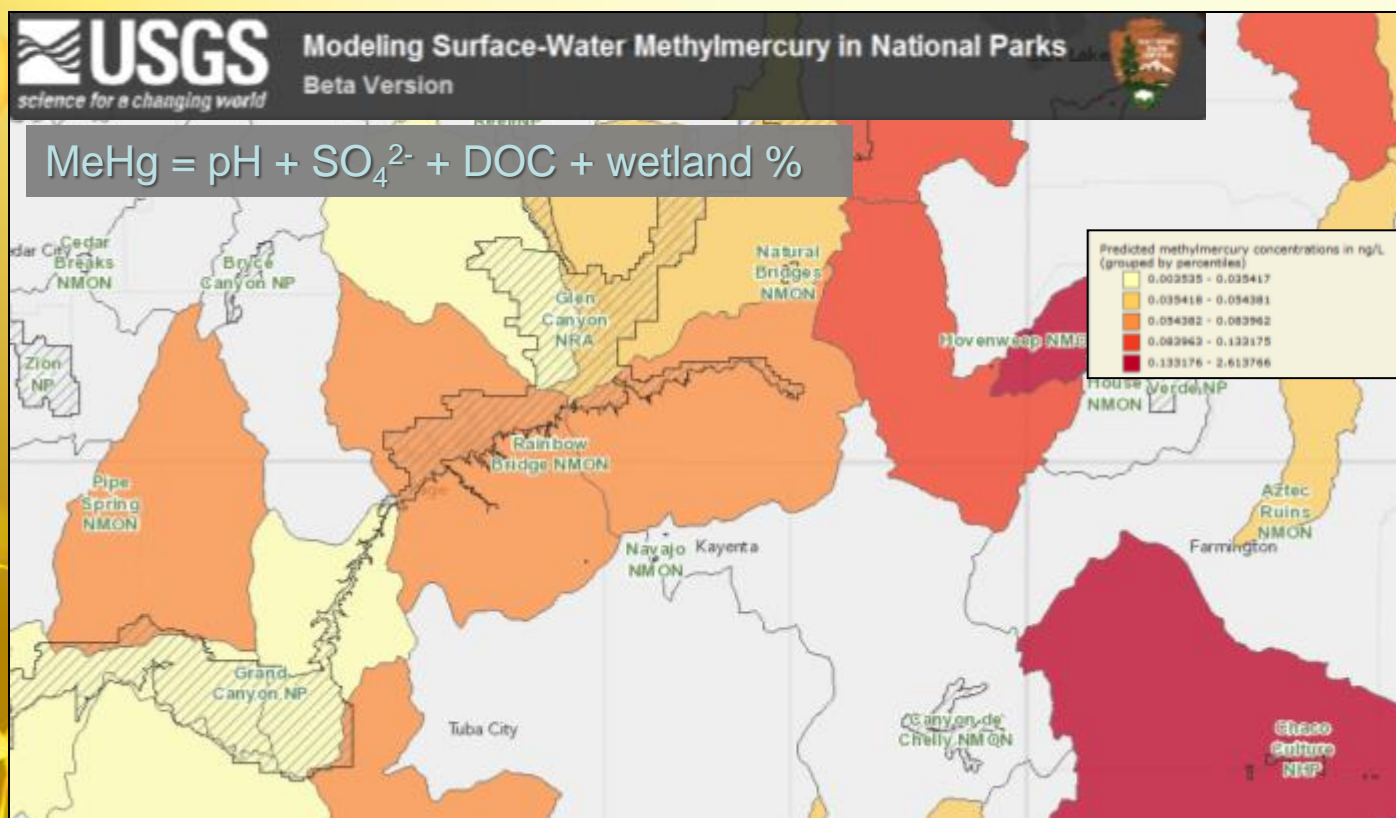
Morris et al. 2013

*only 10 MDN sites across US & Canada qualified to run a minimum of 7-year trends

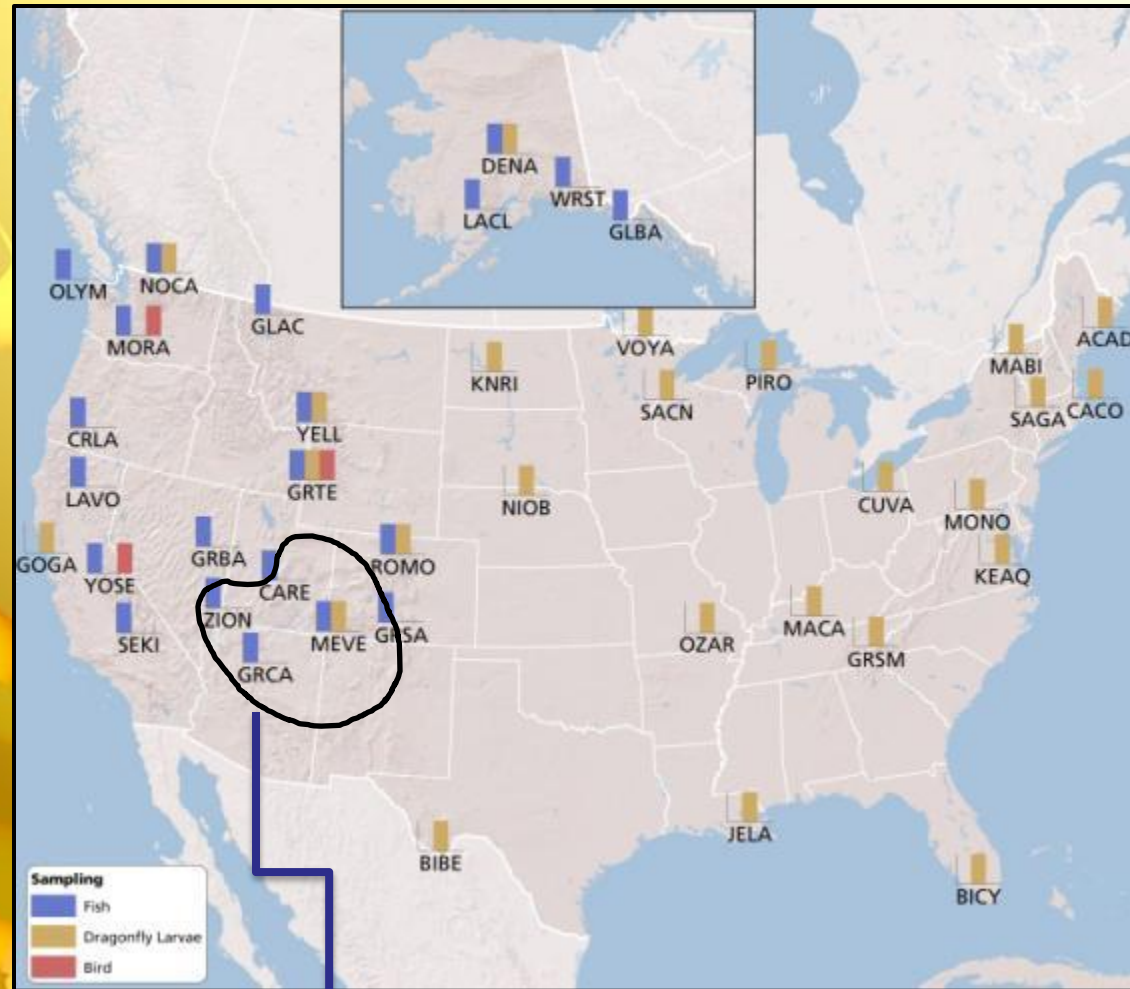


Mercury Risk Assessment

NPS/USGS study estimates methylmercury (MeHg) concentrations in surface water from NPS units in the Four Corners is moderate to high as compared to other units.



NPS-led Studies of Mercury in Fish and Dragonfly



Four Corners

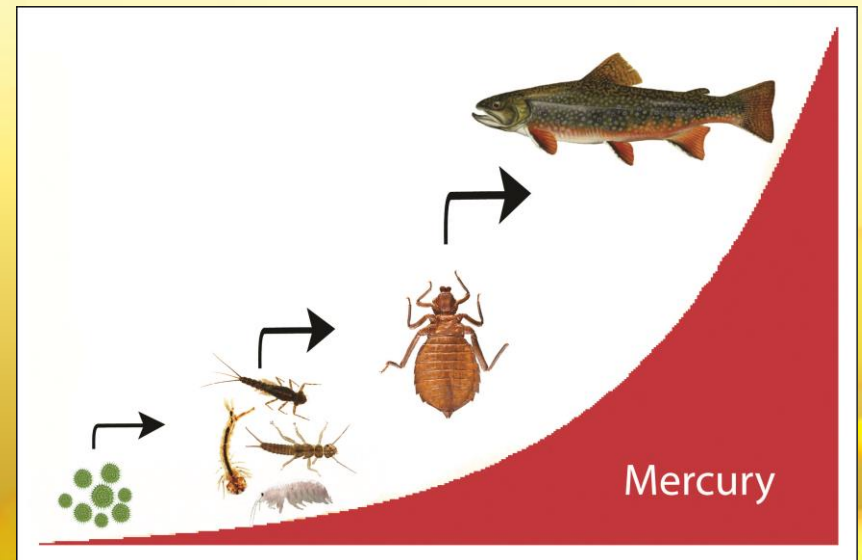
- Fish
 - Utah
 - Zion
 - Capitol Reef
 - Arizona
 - Grand Canyon
 - Colorado
 - Mesa Verde
- Dragonfly
 - Mesa Verde
 - Grand Canyon

Mercury in Dragonfly Larvae – Grand Canyon & Mesa Verde NPs

- Mesa Verde and/or Grand Canyon is 1 of 25 parks participating in a “citizen scientist” study of mercury in dragonfly larvae
 - Partners include Ft. Lewis College and Mancos High School
 - Larvae yet to be sampled

- Mercury in dragonfly larvae correlated to levels in fish & water

(Haro et al. 2013)



http://www.nature.nps.gov/air/Studies/air_toxics/dragonfly/index.cfm

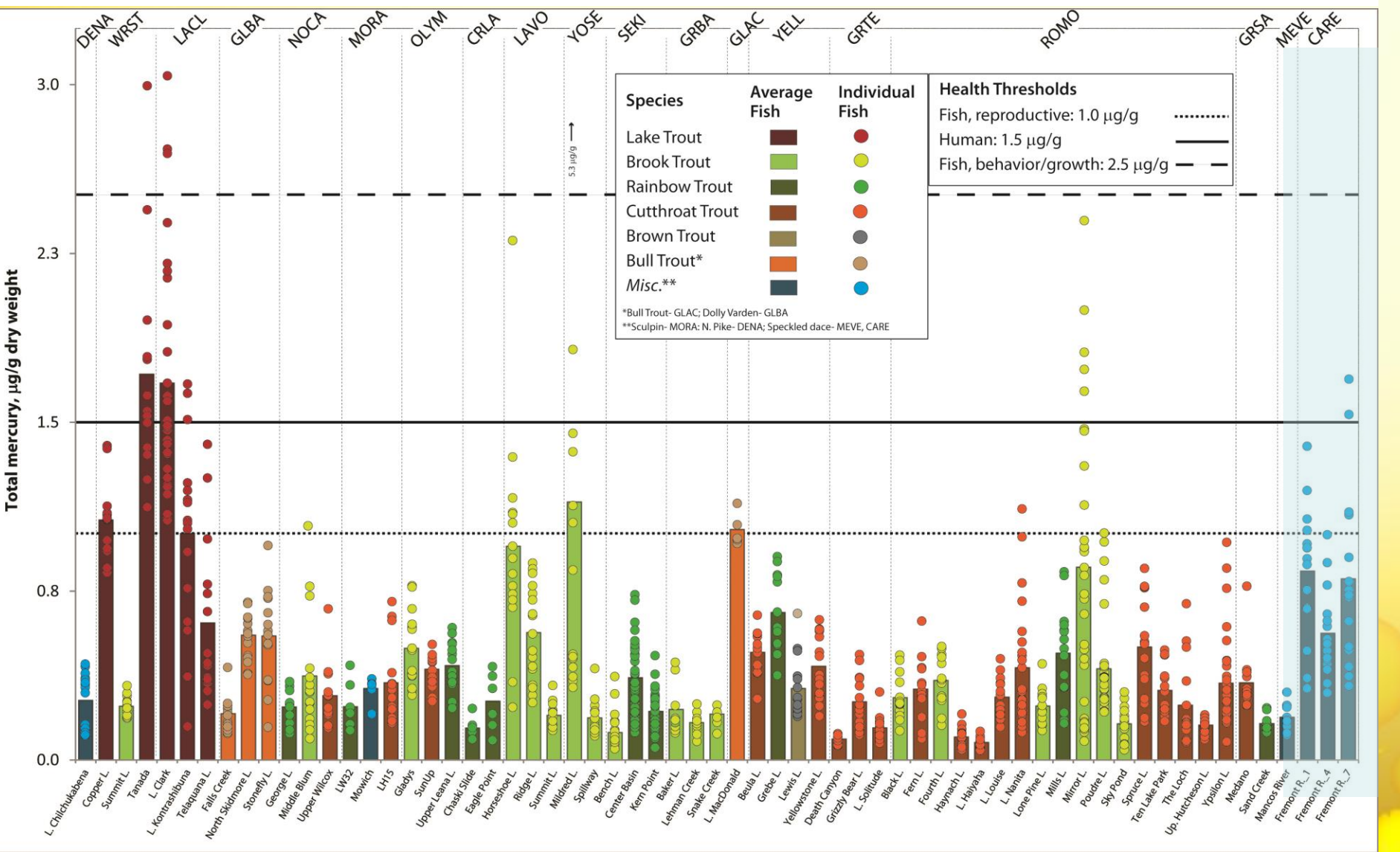
Mercury in Fish – Capitol Reef & Mesa Verde NPs

- Preliminary data indicate levels of mercury that exceed human health and fish toxicity thresholds in speckled dace from Capitol Reef
 - Levels of mercury in fish from Mesa Verde are lower
- Final report expected later 2013
 - Data will also include Grand Canyon and Zion



Speckled Dace. Photo courtesy of FWS.

Mercury in Fish from 20 National Parks in the Western U.S.: Preliminary Data



Total mercury in average muscle filet (bars) and individual fish (circles) based on dry weight from park water bodies, and contaminant health thresholds for fish toxicity and human health. Mean Hg (dw) was 0.7 µg/g (CARE); 0.2 µg/g (MEVE). Flanagan et al. 2013

Mercury in Fish: Lake Powell Advisory

- AZ Dept. of Environmental Quality issued a fish consumption advisory for striped bass
- Lake Powell managed by the NPS as part of the Glen Canyon National Recreation Area

Lake Powell (from Dangling Rope Marina, south to the Dam; Kane County , San Juan County)				
Species	Hg Level	PWC	WCB	AWM
Striped Bass	0.35	1 4-oz m/m	2 8-oz m/m	8 8-oz m/m

4-oz m/m = 4 ounce meals per month*

8-oz m/m = 8 ounce meals per month

AWM = Adult Women Past Child Bearing Age and Men >16

Hg Level = Average Fish Mercury Level (ug/g)

PWC = Pregnant Women and Children < 6

WCB = Women of Child Bearing Age and Children 6-16

Source: Utah Fish Advisories <http://www.fishadvisories.utah.gov/#powell>

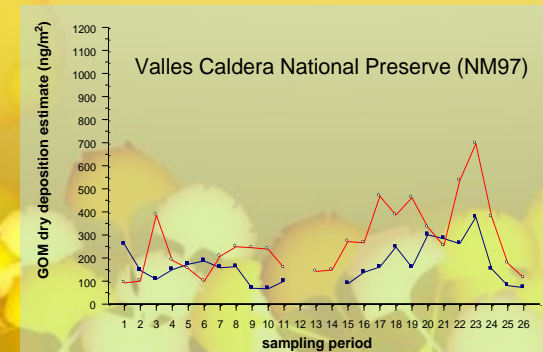
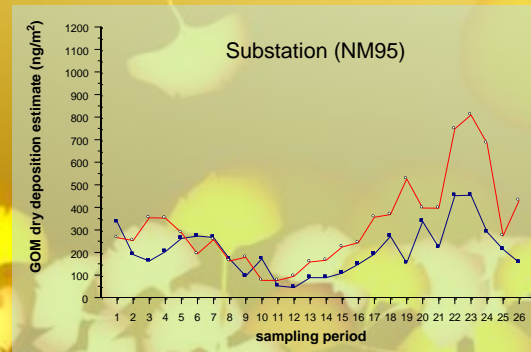
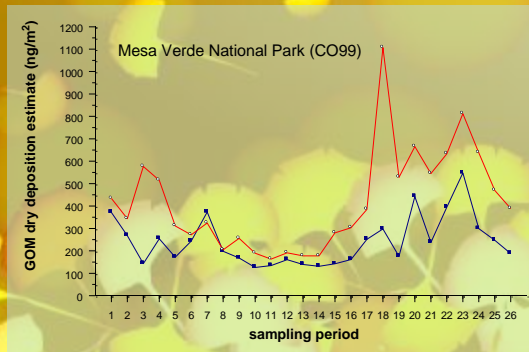


Studies of Mercury in biota:

- Provide baseline data to better understand the spatial distribution of mercury contamination
- Target sites for more intensive study in national parks
- Expand the geographic scope of research previously conducted by scientists, filling data gaps
- Inform and engage diverse audiences about possible impacts and health concerns related to mercury levels
- Contribute to regional and national scope research and policy efforts like Total Maximum Daily Loads, Four Corner Air Quality Group, Western North American Mercury Synthesis, and EPA rules

Region 6 Passive Mercury Regionally Applied Research Effort (RARE) Projects

- Recently completed project taking first time measurements in Four Corners area and Eastern Oklahoma (Sather et al., 2013). Gaseous oxidized mercury dry deposition measurements in the Four Corners Area and Eastern Oklahoma, U.S.A. *Atmospheric Pollution Research*, 4 (2013) 168-180.
- Highest GOM dry deposition estimates measured at Mesa Verde National Park; strong regional signature found in GOM dry deposition data set.
- 51% of estimated total mercury deposition at Mesa Verde National Park was GOM dry deposition for two year study.
- Data time series below: year 1=blue, year 2=red; measurements taken from August, 2009-August, 2011



Region 6 Passive Mercury RARE Projects

- The data from the study provide a two-year baseline of gaseous oxidized mercury (GOM) dry deposition data in the Four Corners area and eastern Oklahoma immediately before the current implementation of new U.S. power plant and boiler mercury control regulations; future monitoring data can help assess effectiveness of new mercury pollution controls on power plants and boilers. Region 6 would appreciate ORD support for this future proposed monitoring through the RARE program in the 2015-2017 time period.
- Currently working on paper summarizing new gaseous oxidized mercury dry deposition measurements taken in Texas, and comparing to previous Four Corners measurements.
- Region 6 has enjoyed working with ORD on these projects, including the ORD project sponsor Shaibal Mukerjee.
- These studies have involved a great team: EPA R6, ORD, EPA Houston Laboratory, other Federal Agencies (NPS, BLM, USFS, USFWS, Valles Caldera National Preserve), States (NMED, TCEQ, Texas Parks and Wildlife Department), Tribes (Cherokee Nation, Jemez Pueblo), Contractors (Frontier Global Sciences, Alion)
- The Four Corners and Texas passive mercury measurement projects are a part of EPA's Air, Climate, and Energy (ACE) Strategic Research Action Plan for 2012-2016 (Line item 2.2.17 under Theme 2, Science Question 2.2).

Questions?

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